Renewable and Sustainable Energy Reviews 32 (2014) 100–106

Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: www.elsevier.com/locate/rser

Social acceptance of renewable energy sources: A review of contingent valuation applications

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ARTICLE INFO

Article history:
Received 5 March 2013
Received in revised form
30 September 2013
Accepted 18 December 2013
Available online 25 January 2014

Keywords:
Sustainable development
Renewable energy sources (RES)
Contingent valuation (CV)
Willingness-to-pay (WTP)
Social acceptance
Green consumerism

ABSTRACT

This paper presents a literature review addressing the public acceptance of renewable energy as a replacement for fossil fuels in electricity production. This review was motivated by the global tendency for a substitution of conventional fuels by renewable energy sources (RES) during the global financial crisis. It studies research on the preferences and attitudes of local communities towards investments in renewable energy projects and their perception of the use of new energy technologies in their daily lives, through various case studies worldwide. An effort is made to identify the parameters that influence consumers′ energy behaviour, together with their interest, or lack thereof, in the environmental impact of using fossil fuels to produce energy and their willingness to reduce it. Applications of contingent valuation are examined, which are employed to analyse public attitudes towards the use of RES for electricity production. Willingness-to-pay is observed to be correlated to socioeconomic characteristics including education, interest in environmental issues and knowledge of RES. Finally, the profile of a typical green energy consumer and appropriate policy paths for the penetration of RES into the energy market are outlined.

Contents

1. Introduction

Internationally, there has been a recent surge of concern regarding the increasing emissions of air pollutants and global climate change on the one hand and increasing energy consumption and the security of energy supplies on the other [1–4]. This concern goes hand in hand with the occurrence of environmental problems resulting in the disruption of the balance of ecosystems [5]. Human activities threaten the sustainability of environmental and socioeconomic systems. The international community, realizing where this situation may lead, is compelled to take measures aimed at reducing greenhouse gas emissions and tackling climate change. Renewable energy sources (RES) are favoured as a means of reducing the use of fossil fuels [6]. Over the years, there appears to have been an increase in public awareness of the adverse environmental effects of the consumption of

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http://dx.doi.org/10.1016/j.rser.2013.12.026

fossil fuels. Conventional sources of energy, especially coal, are characterized by the highest carbon dioxide emissions per kW h, low cost and high availability [7]. Compared to more environmentally friendly energy sources, conventional fuels cost less but their cost does not reflect true social externalities. On the other hand, green energy sources have lower social costs but are more expensive, a fact that prevents them from becoming more widespread [8,9].

This paper is a review of existing literature that pertains to the acceptability of renewable energy by the public using the contingent valuation method (CVM), a prominent non-market valuation technique. The main objective of the present paper is to examine research that investigates the preferences and attitudes of local communities towards investment projects that harness renewable energy through various case studies worldwide. The behaviour of local communities is evaluated, more specifically how the inhabitants of local communities perceive the use of new energy technologies in their daily lives. Moreover, the present research investigates the need for the integration of renewable energy into modern society and its contribution to the demands of modern societies, with particular emphasis on addressing major contemporary crises identified at an economic, social and environmental level to ensure sustainable development. Emphasis is given to the following: the importance of using renewable energy; the necessity of its penetration into the energy mix (with a view to its establishment as an energy source); its emergence as a possible solution to crisis management; and the benefits resulting from its implementation. Reference is made to the advantages and disadvantages of using RES, and their contribution to the achievement of sustainability is highlighted. Their potential to increase investment prospects and social expectations while addressing the conditions of economic insecurity is also noted. Their utilization will possibly give impetus to the businesses of the future.

While studying the given literature, it is of great interest to evaluate the level of information and knowledge on new energy technologies in general, and more specifically on certain types of RES. In addition, the degree of influence on consumers′ energy choices and interests is worth evaluating. This work focuses on the value of using more environmentally friendly forms of energy, and their valuation in economic terms, through the application of the CVM. The core of the method is to try to define the economic contribution a person is willing to offer in order to maintain an environmental good (willingness-to-pay or WTP) through suitable payment schedules and options. Another research objective is to identify, through the literature review, the parameters that influence consumers′ energy behaviour as well as their interest or lack thereof in the environmental impact of using fossil fuels to produce energy and their willingness to reduce it. Here, the research focuses on the correlation of key socioeconomic and demographic characteristics of households, such as gender, age, education level, number of household members, number of minors in the household, employment and membership of environmental organizations, with WTP. Additionally, an attempt is made to outline the profile of a green energy consumer as gleaned from the literature. Furthermore, the present study examines the overall perceptions of local communities regarding investments in RES. It assesses the factors that lead to the acceptance or rejection of a project, the main obstacles that arise during its implementation, the possible consequences of an investment project based on RES exploitation, and the necessary measures for an increased share of RES in the energy mix. Finally, the main features of the current energy policy at the global and European levels are listed, with special emphasis on the legal framework of Greece.

The rest of the paper is structured as follows: Section 2 presents the analysis of the literature, with Section 2.1 considering the relationship between sustainable development, energy and RES, Section 2.2 presenting the key issues of the energy policy of the European Community with a focus on Greek regulations, Section 2.3 reporting on social acceptance, Section 2.4 reviewing the internalization of external costs and the switch to “green energy”, Section 2.5 looking into the financial crisis and “green development”, and Section 2.6 reviewing CVM applications. Finally, Section 3 presents concluding remarks.

2. Literature review

2.1. Relationship between sustainable development, energy and RES

Although defining sustainable development is not trivial, it may be thought of as economic development that offers quality of life for all within the carrying capacity of nature, stressing how human activities are constrained by economic, social and environmental limits [10–12]. It may also be described as total sustainability, stipulated for the satisfaction of human needs, through socially accepted technological systems and appropriate policies and political instruments [10]. Energy is an important concern in sustainable development, leading to significant environmental pressures at the global, national, regional and local levels [13,14]. Electricity production in many countries is based on a variety of energy sources (including solid mineral fuels, oil, gas, nuclear power and RES) [3,15,16] and is an important contributor to economic development [17–19]. The energy industry is the basic factor for both the development of the economy and the improvement of quality of life, in combination with environmental protection [17]. RES offer great potential for sustainability and are emerging as technically feasible, economically viable and socially acceptable alternatives [20–22]. Power generation may become greener as a result of a reduction in carbon dioxide emissions, which may be achieved by a shrinking of the share of fossil fuels accompanied by an increase in renewable energy generation in the final mixture [18]. RES such as solar, wind and biomass play a vital role in meeting the growing energy demands of developing countries [20,21]. The most important key indicators of sustainability that can be assessed are the price of electricity generation, the energy pay-back time, greenhouse gas emissions, the availability and limitations of each technology, the efficiency of energy transformation, the land use requirements and the social impacts [7,16]. RES ensure a balance between economic, technical and environmental systems.

Renewable energy technologies have both advantages and disadvantages. The advantages of RES include the following: addressing environmental concerns; decreasing operating costs (which, contrary to conventional fuels, are not affected by the state of the global economy); reducing dependence on fossil fuels; energy security; reliability of electric power systems; energy quality; benefits for tourism; better quality of life; conservation of natural resources; assisting in local development; and creating new jobs [4,5,13,22–24]. Disadvantages include changes in the aesthetics of the landscape and visual intrusion of facilities, impacts on flora and fauna, noise pollution, and high installation costs [12,19,24]. These disadvantages are unfortunate because energy is an important factor in economic growth and prosperity, satisfying human needs and improving the quality of life [25]. The ready availability of energy is a prerequisite for the functioning of modern societies, and the demand for energy resources affects the politics of countries in all stages of development [15].

2.2. Energy policy in the EU: Focus on Greece

Having looked at the relationship between sustainable development, energy and RES in particular, attention is not turned to energy policy in the European Union (EU). Globally, the USA is the first country in terms of energy consumption, followed by China [17].

Important aspects of energy policy include climate change and energy security, energy reliability, energy affordability, and market competitiveness for businesses, industries and households [26]. Therefore, it comes as no surprise that the EU is aiming to strengthen energy security while, at the same time, has set binding goals for the share of RES in the energy mix by 2020 [27]. The Action Plan for a Europe-wide Energy Policy attempts to address global climate change, reduce soaring energy demand and oil imports, create new jobs (in a time of global financial crisis), and promote green energy technologies. Energy security is of paramount importance: if the supply is interrupted or severely affected (e.g. due to further depletion of fossil fuels), disturbances will be caused in the financial functioning and social welfare of countries [4]. Member states are required to submit National Action Plans for Renewable Energy. Ultimately, for the development of a single electricity market, the EU requires its member states to align their energy sector legislation [1] and implement policies to increase the share of RES in the energy mix [28]. The forecast is that, by 2020, energy consumption in Europe will have been reduced to 95% of the 2005 level [29].

Official Eurostat data, depicted in Fig. 1, show the share of renewables in gross final energy consumption in 2010 and the legally binding targets for 2020.

Norway currently has the highest share of RES. Specifically, in 2010, RES made up 61.1% of its energy usage, while its binding objective is 67.5% for 2020. Sweden follows, with 47.9% in 2010 and a target of 49.0% for 2020. Malta had zero RES in 2010, but has a binding objective for 2020 of 10.0%. Finally, for Greece, the figure was 9.2% in 2010, while the binding objective for 2020 is 18.0%.

Countries such as Norway and Sweden, with their high percentage of RES in their energy mix, are very close to achieving their ambitious 2020 targets already, with Latvia, Finland and Austria close behind. A variety of other countries, such as Belgium, Cyprus, Ireland, Luxembourg, Malta, the Netherlands and the United Kingdom, have a long way to go. As a whole, the EU is about two thirds of the way towards meeting its 20% 2020 target. It should be kept in mind that RES do not make up a high percentage of the energy mix at present, mainly because their cost is still higher than that of conventional energy sources. However, their exploitation contributes to addressing environmental problems, to improved security and reliability of the energy supply to the grid, and to economic development through the creation of new jobs. The term "energy security" is used to characterize the availability of sufficient energy to meet the needs of the entire supply chain, from source to final consumer, i.e. the ability of the system to supply its customers while minimizing the risk of failure of the supply chain, even in peak periods. Security of the energy supply is closely linked to the energy demand, as growing demand creates a risk to energy security. The reliability and continuity of electricity that will not be exposed to supply disruptions and sharp price increases is very important. The EU, moving in this direction, considers supply security to be one of the main axes of European energy policy, hence its binding objectives for 2020.

Greece enacted Law 3468/2006 [30] in compliance with Directive 2001/77/EC [31], in order to create an appropriate legislative and regulatory framework that supports investment in renewable energy and high energy efficiency in both heat and power; this is expected to both increase the share of such resources in the energy mix of the country and reduce carbon dioxide emissions [5,23,29,32]. In addition, the Greek government implemented Law 3851/2010 [33] in order to achieve a higher (20%) target for the share of RES in final energy consumption, implying a 40% share of RES in electricity, 20% in heating/cooling, and 10% in transport. Finally, a National Action Plan for RES has been prepared in the context of Directive 2009/28/EC [29,34]. Among other things, such legislation simplifies the environmental licensing of projects and strengthens the Special Framework for Land Planning and Sustainable Development for RES. This legislation is thought to hold great development potential and is expected to boost the economy, increase competition, create new jobs, stimulate local industry, and provide clean, domestically produced energy to consumers and industrial users. The participation of local communities in RES projects is also hoped to provide environmental and economic benefits for island tourism [14].

Having discussed the role of renewable energy in sustainable development, attention is now shifted to the acceptance of RES by the public.

2.3. Social acceptance

In democratic societies, inputs to the planning and decision-making process include expert opinions as well as public feelings and perceptions [10,35], the problem being that rational individual behaviour may conflict with the common good and prevent the efficient use of public resources. This was famously pointed out by

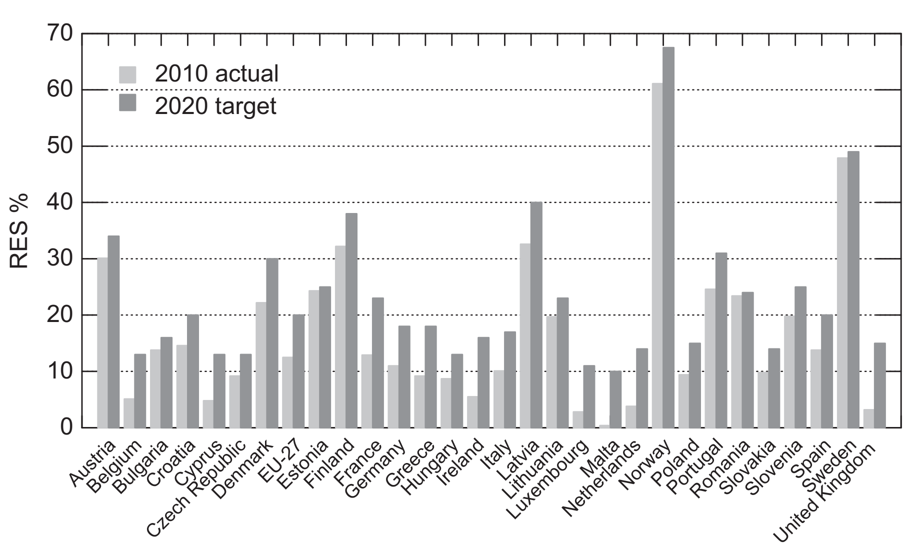


Fig. 1. Comparison of renewable energy for EU countries in 2010 and commitments for 2020.
Source: Eurostat. This bar chart shows the share of renewable energy technologies in gross final energy consumption in 2010 and the legally binding targets for 2020 for all EU members. Norway has the highest share of RES, followed by Sweden, while Malta comes last with zero at present.

Hardin [36] in his seminal work, Tragedy of the Commons (1968), and depicted in the prisoner′s dilemma, a game-theoretic model where the equilibrium solution (which is dominant for individual players) is different from the cooperative solution (which is best for society). Still, if feelings and perceptions (i.e. attitudes) did not determine behaviour, this would not matter. So, an interesting question arises that is worth investigating: is behaviour connected to attitude?

A succinct overview of the related literature is presented by Paravantis [37]. The term "attitude" is used to relate to an evaluative judgment of a particular concept or entity by a person [38]. Beliefs, principles and behaviours that a person maintains on issues related to the environment formulate their mental attitude [39]. Defining environmental attitudes in a precise fashion is not easy, and thus it is quite difficult to use them in order to predict environmentally friendly (often referred to as ecological) behaviour [40]. The theories of reasoned action [41] and planned behaviour [42] stipulate that behavioural intention precedes explicit behaviour. The theory of planned behaviour identifies elements of behaviour that are beyond willed control, and is useful for predicting ecological behaviour, while environmental attitude is regarded as a complex entity consisting of environmental knowledge, environmental values, and ecological behaviour intention [43]. A strong correlation between environmental attitude and ecological behaviour intention has been established. Research studies show a relation between environmental values and ecological behaviour, probably through the mediation of a third variable that, according to the theory of planned behaviour, is ecological behaviour intention [44]. To sum up, people advance along a continuum of competence in environmental knowledge, in stages that include awareness, concern, understanding and action [37,45]. So, yes, actions do ultimately follow attitudinal perceptions.

Thus, it is established that it is important to know the attitudes of electricity consumers since their attitudes are the foundations of their resulting behaviour [46]. Three specific parameters appear to underscore public behaviour: (a) information possessed by the public, (b) the public′s perceptions and positions, and (c) fear, i.e. danger or anxiety that intensifies with ignorance [9,10,12]. These must be investigated further.

Let the focus be shifted on the attitudes of the public towards RES. To be sure, numerous parties appear to be involved in RES projects, including local communities, local agencies, investors, nongovernmental organizations (NGOs), and local information networks. Although these actors have different attitudes and conflicting interests, they must find ways to cooperate [13]. Requirements for cooperation include cohesion, elimination of personal interest, complete and correct information, and representation, i.e. the participation of all stakeholders in the decision-making process [12,13]. Private and public entities that participate are invited to develop sustainable technologies that are economically vital and socially acceptable. Assefa and Frostell [10] put it nicely by writing that social effects shape society as a whole and each member individually, and are accompanied by public acceptance that is an important component of sustainability. Yet opposition is not uncommon: resistance to a project that is unwanted by the local community is called the NIMBY (Not in My Back Yard) phenomenon [5,12,47], and may result in social conflict and economic losses [35]. The opposite phenomenon is called PIMBY (Please in My Back Yard), and is considered to occur when a project is regarded as beneficial (e.g. because it may be a source of income) and viewed positively by neighbouring communities [35].

To gain further insight into the attitudes of the public towards RES projects, it is fruitful to search for potential barriers to a RES project, as well as measures that may be used to lift such barriers and improve the outlook of RES projects. The research literature lists a wide variety of potential barriers that relate to how the public perceives RES projects, and how it is impacted by them [22,23,35,47–51]. Economic and institutional factors include economic conditions in the region, problems with (public or private) ownership, lack of financial incentives, high investment costs compared to installations relying on the combustion of conventional fuels, inefficiencies in the existing legal framework, and bureaucratic problems or complex licensing. Technical and planning factors include local geography, process problems for the selection of an appropriate application site, planning problems, issues with the previous use of the chosen location, and impacts related to the distance of residents from the power plants (such as visual intrusion and noise pollution). Finally, factors related to the perceptions of the public include a lack of information or knowledge on the new technologies, mistrust, lack of impartiality, and suspicion towards investors.

As well as the barriers, it is worth considering the main consequences of a RES investment project [5,10,19,22,23,35,47–49,52,53]. Again, these include economic effects such as monetary benefits for nearby communities, e.g. the sharing of project profits, new employment opportunities, benefits (or costs) in terms of tourism, and a broader economic boost to the entire region [13]. There are also environmental and quality-of-life impacts that include possible disruption to the balance of nearby ecosystems, visual impacts such as landscape deterioration, noise pollution and vibrations, and other improvements or deteriorations in the quality of life in the area. Important energy effects include an increase in the safety and reliability of the energy supply, a reduction in the dependence on fossil fuels and an improved outlook regarding greenhouse gas emissions, and favourable impacts on the worldwide depletion of oil (especially important as the world moves past the era of peak oil). Economic, environmental and energy impacts determine (in part) whether the completed project is accepted (or not) by the public.

Finally, it is a good idea to consider measures that can eliminate barriers and benefit RES investments. These include mandatory constraints such as binding emissions reduction targets at the national level and a connection of local policy making to national energy policy, added motivation provided by, for example, financial incentives and the simplification of licensing procedures, more efficient processes, achieved for example through better coordination between the parties involved, and the building of trust to increase acceptance by local communities, for example by addressing the fear of uncontrolled development profits at the expense of the public good [13,23,35,48].

2.4. Internalization of external costs and the switch to green energy

One important advantage of RES is the internalization of external costs [3]. External (i.e. environmental) costs are a significant part of total social costs and, in the case of RES, are quite low [50]. The quantification of environmental impacts is a useful currency for addressing environmental problems comprehensively, and developing a sound energy policy [11]. Economists argue that, when externalities occur, they should be internalized and taken into consideration by decisions makers. Economic incentives may be a good market tool through which to absorb such externalities [4]. The problem with RES projects is that they are more expensive than comparable works using conventional energy sources, and that the additional cost born by society creates a climate of aversion among the public. Thus, despite their environmental benefits, RES projects lack widespread acceptance [9]. Yet, as consumers become more environmentally conscious and are willing to pay a higher price for green electricity, the utilization of RES will increase—it all hinges on whether consumers are willing to make the switch to green energy [46].

2.5. The financial crisis and green development

The concern is that, in these volatile times of a global financial crisis (possibly the worst since the Great Depression) with high unemployment, the public may be too impoverished, uncertain and reluctant to take a friendlier stance towards the environment and move from acceptance to actual behaviour by switching to green products and services that are not only costlier but unfamiliar, as is the case with RES projects [54]. Environmental quality may well be a luxury [55] as people may be more interested in saving money than the environment [26]. On the other hand, jobs generated by RES projects may constitute an important factor in the improvement of economic conditions in society. In fact, the number of RES-related jobs is growing constantly, while there is a relative decrease in the number of jobs related to conventional fuels [4]. The RES industry supports employment by entailing high investment, large capacities, and reduced imports and investments in fossil fuels [56]. Effects on tourism may also be manifold as economic, social and cultural factors become involved. All in all, RES may represent a driving force for local development [13].

In contrast to the generally adverse economic situation, green consumerism has emerged recently and is gaining ground by helping to meet the emissions reduction targets via green energy programmes, incentives for investment in RES, and new tax regimes [1]. Green financial incentives help energy projects to succeed, while consumers prefer electricity generated from RES [1,35]. Tariffs that favour green energy sources help guide the public in funding renewable investments [26]. It is believed that, while taxes force market equilibrium at a lower level of production and demand, subsidies help to achieve a balance at higher levels of production and demand, without market distortion. Regardless, any activities that attempt to promote the introduction and penetration of renewable energy should not disregard the characteristics and attitudes of the local communities to which they are addressed [13,25]. Therefore, renewable energy cannot comprise a large percentage of the energy mix without political support [29].

The question is this: how may one quantify and measure public acceptance of RES? To address this issue, this review now turns to literature related to the application of contingent valuation (arguably the best known non-market valuation technique) to the context of renewable energy.

2.6. The contingent valuation method

External costs and benefits that are not easy to quantify as they refer to non-tradable goods may be estimated by applying non-market valuation techniques and data from field studies [57,58]. The CVM is based on information collected from individuals or households in the region affected by the project under investigation [58–60]. The CVM calculates the financial contribution that people are willing to make in order to prevent or remedy environmental damage (WTP) or the economic compensation that people are willing to accept in return for taking on a new environmental burden (willingness to accept, or WTA) [53,58–60].

The CVM literature confirms that energy investments increase living standards [28,61]. Respondents tend to agree that investment in renewable energy projects is a way to combat climate change and achieve energy security [6], and seem to believe that renewable energy technologies will be widely used in the future [9]. In fact, a positive predisposition towards RES is combined with a negative predisposition towards conventional energy sources [28,61]. The public sometimes hesitates to embrace new technologies, though, and a lack of familiarity may breed fear when it comes to untested energy technologies [10]. Koundouri et al. [28] found that respondents had a positive view of new energy technologies but preferred conventional technologies that were more familiar to them. Confirming this, Hanley and Nevin [53] found acceptance to increase when respondents were in possession of sufficient information and were able to participate in the decision-making process. Even so, not all forms of renewable energy are equally accepted. For example, Borchers et al. [8] found that individual consumers expressed a greater preference for solar energy, followed by wind power and biomass. In a different study, Hanley and Nevin [53] found respondents to express their support (on a five-level Likert scale) as follows: for small hydro projects, the amount of support was 52%, for wind projects it was 35%, and for biomass it was 30%. Residents have expressed doubts over the credibility of green power [54], while local communities may react negatively to nearby green investments as per the NIMBY phenomenon [47]. When the public resists green investments locally, economic losses, social tensions and conflict result [35]. Yet, while a NIMBY attitude may invalidate a positive policy, positive social conditions locally may offset a negative institutional framework [48].

How big can WTP be in the case of RES projects? All in all, a positive cost-benefit calculation is a key indicator of public acceptance [12]. It has been found that, while consumers are willing to pay more in electricity bills for the internalization of the external costs of energy production [62], the amount each person will pay depends on their disposable income [1]. Higher-income respondents were willing to pay an extra 16.6% [1]. Even the method of payment has been found to affect WTP [63]. Within households, respondents that were responsible for paying electricity bills were less interested in paying more for RES [61]. In another study, based in Texas, half of the respondents chose to pay only the minimum amount, of one dollar per month, in order to support RES investments [61]. In comparison, the average WTP for renewable energy was found to be a whopping 2000 yen per month ($20 per month in current prices) per household in Japan [9]. Finally, the average WTP per household in Crete, Greece, was estimated at €16.33 per quarter, as a surcharge on electricity bills [24], amounting to about €5 per month [28]. Unwillingness to pay more money has been attributed to the physical distance from a RES project, low income and an overall low priority given to environmental issues [64].

Which variables affect WTP in the case of RES? Several studies show a correlation between WTP and socioeconomic characteristics, knowledge about RES and concern for environmental issues, mainly climate change [1,12,61,63]. WTP has been found to be negatively correlated with age and household size, and positively correlated with income and educational level [6,61,64]. In one study, the male population indicated a greater WTP for renewable energy than the female population [61]. In the same study, homeowners indicated a greater WTP than tenants; this may partially be due to the fact that people living in privately owned homes may be able to choose freely among alternative electricity suppliers; if they are environmentally aware and willing to pay more for RES, they will opt for a greater share of green electricity [46]. On the role of children, Longo et al. [4] found respondents with underage children to be more positively inclined towards policies that favour RES; on the other hand, Koundouri et al. [28] found the number of children a respondent had to be negatively correlated with WTP. Increased WTP has been recorded among those who are more knowledgeable about energy issues, are more concerned about environmental problems, have already invested in renewable energy, and who have had problems with their electricity supply [24]. Education has also been found to be correlated with higher WTP values [28], while the highly educated and members of environmental organizations have been found to display a more positive attitude towards RES [4]. Finally, important institutional factors affecting public acceptance include ownership status, political governance,

bureaucratic problems, and information and public participation [28,35,46,49,51,53,65].

Significant differences have been observed between the preferences of urban and rural communities. The rural population has received negative environmental impacts from the implementation of RES projects, resulting in unwillingness to pay [55], although the utilization of renewable energy in remote areas could bring about positive effects, such as an economic boost and environmental improvements [53]. Urban people, on the other hand, have identified benefits associated with RES, for example the reduction of air pollution and the preservation of wildlife. Also, the creation of jobs has been found to be more important for urban populations [55]. The same study found respondents in rural areas to be willing to pay a surcharge of 1.08 British pounds per year per household in order to support new jobs coming from renewable energy projects. In addition, in a rural area of Kenya, it was found that households in the area were willing to pay more for grid electricity than for electricity from photovoltaics. According to the same study, households in Kenya favoured monthly payments for electricity connections instead of a lump sum amount [66].

Differences have also been found between the attitudes of the public in island and mainland areas. Many islands experience electricity production deficits, especially during the tourist season [51], while wind energy is gradually penetrating the insular mainland with, frequently, huge turbines. Compared to those on the mainland, islanders may also be more open-minded, as they are exposed to new ideas originating from visitors from other (usually more developed) countries [47].

As was seen in the previous section, attitudes do not translate into actions automatically. Thus, it makes sense to ask how preferences relate to behaviour in the case of RES projects. Diaz-Rainey and Ashton [26] have listed a number of factors that may cause stated preferences to diverge from actual behaviour, namely, free rider problems (i.e. the prisoner′s dilemma effect), bandwagon effects, an observed upwards bias in the CVM, a lack of knowledge as to green power availability, marketing and the provision of information on green energy, a hesitancy to switch from one electricity supplier to another (switching inertia), distrust of energy product suppliers and cost concerns, and, finally, search costs involved in switching. Of note is the fact that the WTP that relates to a project funded privately has been found to exceed the WTP that is related to public (i.e. state) projects [63]. More important differences may exist between local communities and the national average: not only may the percentage of local people who declare a positive WTP be quite different from that at the national level, but the declared WTP may be more different from actual contributions in local societies as the above influences may play a more significant role there [1].

A final question to ponder is as follows: what is the profile of a typical green energy consumer? According to Zarnikau [61], the profile of a green energy consumer in Texas is educated, affluent and over 55 years of age. In another study, Longo et al. [4] found the typical respondent to be about 35 years old, with an annual income of £37,000, and paying around £70 a quarter in electricity bills. Approximately one third of these respondents had one or more children, just over one in five were members of environmental organizations, and they were willing to support environmentally friendly energy policies and to pay more for electricity from RES (with energy security, global climate change and greenhouse gas emissions in mind).

3. Concluding remarks

In this research, a literature review regarding the public acceptance of RES has been presented and discussed. This was intended as an extended review of the literature that addresses the application of the CVM as a means of assessing the public acceptance of renewable energy as a replacement for conventional fossil fuels in electricity production.

From the analysis, the following main outcomes have been obtained: The simultaneous increase in energy demand and the negative impact of fossil fuels on the environment underscores the need for energy production from RES. Although renewable energy is spreading, it still represents a small part of the energy mix globally. In areas experiencing economic difficulties, investments in renewable energy may provide an economic boost. The use of RES provides a good balance between economic, technical and environmental considerations, and contributes to a more sustainable development that will favour future generations. Based on the reviewed literature on RES and the CVM, several research issues arise that remain (partially) unanswered and could fruitfully be subjected to further investigation. Such issues may be formulated as questions such as the following: Do community residents appreciate and accept specific types of RES? How have the global financial meltdown and economic insecurity affected the perceptions and energy behaviour of affluent and poor people, especially in local communities? How will households in such societal groups balance education, recreation, transportation and green electricity production? What is the profile of a typical green energy consumer, what key socioeconomic characteristics affect WTP and how may this relationship be modelled? Finally, can programmes, policies and market incentives contribute to the establishment of RES? These questions can be answered by descriptive and inferential analysis and the development of models that will require the use of appropriate statistical programs and the implementation of appropriate econometric and multivariate statistical methods (such as principal component, cluster, multiple regression and canonical correlation analyses).

This literature review and the issues that it brings forth have practical significance. The connection of household characteristics to public preferences will be useful in improving electricity services, designing better energy policies and increasing the demand for reliable energy sources [55,67]. CVM results could also provide quantitative information that will be useful in designing environmental policy [61] and may help in targeting state funding for the protection of the environment [64]. Important conclusions drawn from this may be used as a basis for sustainable energy planning, the design of good energy policies, the promotion of innovative energy technologies, more environmentally friendly policies, as well as investment programmes utilizing RES.

Acknowledgments

The authors thank Dr. Emily Stapleton (http://www.academic-proof-reading.co.uk) for proofing this paper.

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